Agenda

• Introduction around the room

• Overview of the project

• Interests and scientific objectives of those in the room

• Funding Options
Motivation

• One quarter of US population thinks the sun revolves around the earth (2014 NSF survey)

• Eclipses are rare, life-altering events, and have significant impacts on the atmosphere

• Use the excitement of the eclipse to gain valuable education, data and infrastructure

• Showcase the importance of STEM in society
Rare Event

Total Solar Eclipses: 2001 - 2050

2033 Mar 30
2044 Aug 23
2046 Aug 12
2024 Apr 8
2017 Aug 21

P. Espenak, NASA/GSFC - 1996 Aug
Rare opportunity to see

http://home.cc.umanitoba.ca/~jander/tot2017/tse17intro.htm
Atmospheric Responses to Path of Totality

Gerasopoulos et al. 2008
Atmospheric Responses to Path of Totality

Kamkumar et al. 2014

http://www.met.reading.ac.uk/Data/CurrentWeather/wcd/blog/the-eclipse-wind-real-or-imagined/

Gerasopoulos et al. 2008
Core Scientific Questions and Objectives

1. What is the magnitude of the temperature drop at the surface, in the boundary layer, troposphere and lower stratosphere? How much time lag is there between the temperature minimum and minimum in solar flux? At which altitude(s) is the temperature variation the largest? Does the cooling and subsequent re-warming signal exhibit vertical propagation?

1. How do temperature reductions vary across the path of totality? Is the response fairly uniform or do asymmetries arise? How far into the penumbral zone do detectable temperature variations extend?

1. How does surface temperature vary within the spatial domain of the path of totality, on fine scales, given variations in land surface cover (grass, cropland, forest, bare soil, urban surface, water i.e. Mississippi, Missouri Rivers)?

1. What is the response of the surface wind field within the path of totality? Does one observe a reduction in mean wind, as well as gust factor (turbulence)? Is the kinematic response instantaneous or time-lagged to the thermal response?

1. Does a low-level jet develop above the surface layer, in response to frictional decoupling, similar to that observed in the nocturnal boundary layer?
Core Scientific Questions and Objectives

6. Is there evidence for terrain-induced wind circulations, as a result of cool, downslope flows i.e. valley wind developing within the river terraces of the Mississippi and Missouri Rivers? Is a mesoscale breeze generated between the St. Louis heat island and surrounding cool countryside?

6. How does cloud cover respond to changes in the boundary layer thermal forcing? If cumulus fields are present during the eclipse, is there a documentable decrease in areal extent/height/vigor of convection? Does a fog or stratus layer form within the large river valleys/floodplains?

6. Can the regional-scale effects described above be simulated using a mesoscale model such as the WRF? What additional scientific (process study) understanding can be gleaned from high-resolution simulations?

6. How are the findings above for the 2017 eclipse compared to that for prior events in other places and to that from other sites (KY and ID)?

6. How are the findings from SLU mesonet compared to that from other mesonets, such as KY and NY mesonets?
Upper Air & Surface Observations

from research, operational, to citizen measurements
Radiosonde experiments at St Louis

ECLIPSE MEASUREMENT NETWORK – ST. LOUIS, MISSOURI REGION

- All sondes along transect launch simultaneously before, during & after totality (spatial sampling mode)
- Central sonde location (Graw) launches 10 sondes sequentially during the eclipse event, spaced minutes apart (temporal sampling mode)
- Mesonet provides surface temperature & wind mapping (eclipse wind)
Considerations for each team

• Site Location Selection for August 21, 2017
• Lodging for August 21, 2017
• Helium Supply for August 21, 2017
• Individual roles within teams for radiosonde launches
• FAA coordination
• Dissemination (shared website? We have a tab here: http://eclipse.montana.edu/radiosonde-project/)
Funding opportunities & collaborations

- Supplies (sondes for 2017 and training before, helium, balloons)
- Resources for data analysis
- Salaries for researcher (faculty, staff, students)
- NWS site participation?